Benchmarking and analyzing iterative optimization heuristics with IOHprofiler

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Abstract:

Comparing and evaluating optimization algorithms is an important part of evolutionary computation, and requires a robust benchmarking setup to be done well. IOHprofiler supports researchers in this task by providing an easy-to-use, interactive, and highly customizable environment for benchmarking iterative optimizers.

IOHprofiler is designed as a modular benchmarking tool. The experimenter module provides easy access to common problem sets (e.g. BBOB functions) and modular logging functionality that can be easily combined with other optimization functions. The resulting logs (and logs from other platforms, e.g. COCO and Nevergrad) are fully interoperable with the IOHanalyzer, which provides access to highly interactive performance analysis, in the form of a wide array of visualizations and statistical analyses. A GUI, hosted at https://iohanalyzer.liacs.nl/ makes these analysis tools easy to access. Data from many repositories (e.g. COCO, Nevergrad) are pre-processed, such that the effort required to compare performance to existing algorithms is greatly reduced.

Outline of Tutorial Structure:

This tutorial will introduce the key features of IOHprofiler by providing background information on benchmarking in EC and showing how this can be done using the modules of IOHprofiler. The key components will be highlighted and demonstrated by the organizers, with a focus on the functionality introduced in the year since the last tutorial. Guided examples will be provided to highlight the many aspects of algorithm performance which can be explored using the interactive GUI.

Organizer/Presenter

Diederick Vermetten is a PhD student at LIACS. He is part of the core development team of IOHprofiler, with a focus on the IOHanalyzer. His research interests include benchmarking of optimization heuristics, dynamic algorithm selection and configuration as well as hyperparameter optimization.

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Furong Ye is Postdoc and obtained his PhD at LIACS. He is part of the core development team of IOHprofiler, with a focus on the IOHexperimenter. His PhD topic is benchmarking discrete optimization heuristics, from building a sound experimental environment to algorithm configuration. His research interests are empirical analysis of algorithm performance and (dynamic) algorithm configuration.

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Jacob de Nobel is a PhD student at LIACS, and is currently one of the core developers for the IOHexperimenter. His research concerns the real world application of optimization algorithms for finding better speech encoding strategies for cochlear implants, which are neuroprosthesis for people with profound hearing loss.

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Hao Wang obtained his PhD from Leiden University in 2018. He is currently employed as an assistant professor of computer science in Leiden University. Previously, he was a PostDoc at Sorbonne University, France (supervised by Carola Doerr). Hao received the Best Paper Award at the PPSN 2016 conference and was a best paper award finalist at the IEEE SMC 2017 conference. His research interests are in the analysis and improvement of efficient global optimization for mixed-continuous search spaces, Evolution strategies, Bayesian optimization, and benchmarking.

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Carola Doerr, formerly Winzen, is a permanent CNRS researcher at Sorbonne University in Paris, France. Carola's main research activities are in the analysis of black-box optimization algorithms, both by mathematical and by empirical means. Carola is regularly involved in the organization of events around evolutionary computation and related topics, for example as program chair for PPSN 2020, FOGA 2019 and the theory tracks of GECCO 2015 and 2017, as guest editor for IEEE Transactions on Evolutionary Computation and Algorithmica, as organizer of Dagstuhl seminars and Lorentz Center workshops. Carola is an associate editor of ACM Transactions on Evolutionary Learning and Optimization (TELO) and board member of the Evolutionary Computation journal. Her works have received several awards, among them the Otto Hahn Medal of the Max Planck Society, best paper awards at EvoApplications and CEC, and four best paper awards at GECCO.

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Thomas Bäck is Full Professor of Computer Science at the Leiden Institute of Advanced Computer Science (LIACS), Leiden University, The Netherlands, where he is head of the Natural Computing group since 2002. Thomas has gained ample experience in solving real-life problems in optimization and data mining through working with global enterprises such as BMW, Beiersdorf, Daimler, Ford, Honda, and many others. He has more than 300 publications on natural computing, as well as two books on evolutionary algorithms: Evolutionary Algorithms in Theory and Practice (1996), Contemporary Evolution Strategies (2013). He is co-editor of the Handbook of Evolutionary Computation, and the Handbook of Natural Computing, and co-editor-in-chief of Springer's Natural Computing book series. He is also editorial board member and associate editor of a number of journals on evolutionary and natural computing. Thomas received the best dissertation award from the German Society of Computer Science (Gesellschaft für Informatik, GI) in 1995 and the IEEE Computational Intelligence Society Evolutionary Computation Pioneer Award in 2015.

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